

## REMARKS

Claims 1-26 were pending prior to the present amendments.

Claim 1 is amended for clarity.

Reconsideration on the merits is respectfully requested.

The application is believed to be in condition for allowance for the reasons set forth herein. Notice thereof is respectfully requested.

### Claim Rejections - 35 USC § 102

Claims 1 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Higgins et al. (USP 5,879,715): .

Higgins et al. is cited as disclosing a process and system for production of inorganic nano-particles in accordance with the present invention. Applicants respectfully disagree.

For a compound or composition of matter to be anticipated by a reference, the reference must place the compound or composition in possession of the public. Furthermore, it must be so particular and definite that from it alone, without experiment or the exertion of his own inventive skill, any person versed in the art to which it appertains could construct and use it. See *In re Brown*, 329 F.2d 1006, 1011, 141 USPQ 245, 249 (CCPA 1964). The reference must

provide a certain degree of precision with respect to the claimed compounds; and the reference must clearly and unequivocally disclose the claimed compounds (without any need for picking, choosing, and combining various disclosures not directly related to each other by the teachings of the cited reference). *In re Arkley*, 455 F.2d 586, 587, 172 USPQ 524, 526 (CCPA 1972).

Amended claim 1 discloses an optionally doped metal chalcogenide prepared by specific steps.

Applicant respectfully submits that Higgins et al. fails to place optionally doped metal chalcogenides prepared by the process disclosed therein in possession of the public. Moreover, both the process of Higgins et al. and that of amended claim comprise at least two steps: a precipitation step and a diafiltration/ultrafiltration step. We contend that the precipitation step in the process disclosed in amended claim 1 is distinguished over the precipitation step in Higgins et al. The process disclosed in Higgins et al. requires in the precipitation step the precipitation of inorganic nanoparticles within a non-continuous micellar phase in a microemulsion containing a non-continuous micellar phase and a continuous phase i.e. the presence of an optically isotropic dispersion of two immiscible liquids. A micelle is defined in McGraw-Hill Dictionary of Scientific and Technical Terms Fourth

Edition, Editor S. P. Parker, McGraw-Hill Book Company, New York (1989) as a colloidal aggregate of unique number (between 50 and 100) of amphipathic molecules, which occurs at a well-defined concentration known as the critical micelle concentration.

However, the precipitation step according to the process of amended claim 1 requires that aqueous solutions are mixed together during the precipitation step which precludes the presence of two immiscible liquids during the precipitation step, since aqueous solutions are freely miscible with one another.

It is not stated in Higgins et al., whether the surfactants used therein are capable of preventing agglomeration during the ultrafiltration process subsequent to the precipitation step as do the compounds present during the diafiltration/ultrafiltration step according to the process of amended claim 1. However, since the precipitation step of the process of Higgins et al. is entirely different from the precipitation step of the process according to amended claim 1, the overall process according to amended claim 1 is patentably distinct and hence novel over Higgins et al.

We therefore contend that amended claim 1 is novel over Higgins et al. under 35 U.S.C. 35 U.S.C. §102(b).

Regarding claim 12, there is no teaching in Higgins et al. regarding performing the ultrafiltration step "in the presence of a compound capable of preventing agglomeration of the nanoparticles

of the dispersion", which has been added to the predispersion after the predispersion has been prepared i.e. after completion of the precipitation step.

We therefore contend that claim 12 is novel over Higgins et al. under 35 U.S.C. 35 U.S.C. §102(b).

Applicant respectfully request withdrawal of the rejection of claims 1 and 12 over Higgins et al. under 35 U.S.C. §102(b).

#### Claim Rejections - 35 USC § 103

Claims 2-6, 13-17 and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins et al. (US 5,879,715) in view of Vacassy et al.

Higgins et al. is applied as before.

The Office opines that Higgins et al. does not specifically suggest producing the chalcogenide ZnS. Applicants agree.

Vacassay et al. is cited as teaching the use of the surfactant thioglycerol in the formation of nanoparticles of ZnS by precipitating cations and anions. Mn doping of the ZnS is argued to also be disclosed. The Office opines, based thereon, that it would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the references because Higgins et al. suggests such precipitation and ultrafiltration process for chalcogenides and Vacassay et al. describes the

precipitation process for such chalcogenide. The Office further argues that with respect to claims 2, 3, 5-6, 13-14, 15-17 and 19-22 it would have been obvious to one of ordinary skill in the art at the time of the present invention to form the Mn doped chalcogenide ZnS by the precipitation/ultrafiltration process because Higgins et al. suggests its use for chalcogenides and Vacassay et al. precipitates the chalcogenide ZnS using the thioglycerol surfactant. The Office admits that Vacassay does not specify the method of removing the nanoparticles from the solution and Applicants agree. Higgins et al. is cited as disclosing mixing of the solutions continuously in col. 6, lines 1-14.

Applicants contend that the inventions of claims 2 to 6, 13-17 and 19-22 are clearly distinguished over that disclosed in Higgins et al., since a totally different precipitation step is disclosed in the process according to amended claim 1 from the precipitation step disclosed in Higgins et al. Vacassy does not mitigate the deficiencies of Higgins et al.

Vacassy discloses that "the synthesis of very small non-agglomerated, nanocrystalline particles in the 5-10 nm size range was also possible, making use of strong complexing ligand (thioglycerol) during the synthesis". However, according to the processes of claim 1 to 7 of the present application, thioglycerol is only required to be present during the diafiltration/

ultrafiltration step and need not be present during the precipitation step. This is clearly demonstrated in EXAMPLE 1 of the present application. Therefore, the precipitation step of Vacassy is also different from the precipitation step of the process according to amended claim 1. Furthermore, in combining the teaching of Higgins et al. with that of Vacassy two immissible phases would be present during the precipitation step, which is clearly not taught by the process according to amended claim 1.

Applicants further contend that there is no motivation for substituting the specific precipitation step of Higgins et al. with that of Vacassy, other than improper hindsight, since it is improper to regard thioglycerol as a surfactant.

In seeking a motivation to combine the teaching of Higgins et al. with that of Vacassy, the Office improperly equates the functions of a surfactant with that of a stabilizer. A surfactant is an abbreviation of surface-active agent, which is a soluble compound that reduces the surface tension of liquids, or reduces interfacial tension between two liquids or a liquid and a solid [see McGraw-Hill Dictionary of Scientific and Technical Terms Fourth Edition, Editor S. P. Parker, McGraw-Hill Book Company, New York (1989), at page 1862]. A stabilizer stabilizes in some shape or form the entity with which it is associated.

Applicants respectfully submit that amended claim 1 and claims 2-6, 13-17 and 19-22 dependent thereon are patentable under 35 U.S.C. §103(a) over Higgins et al. in view of Vacassy.

Claims 7-11, 18, and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins et al. (US 5,879,715) in view of Vacassy et al. and Lackowicz et al. (WO 00/46839).

Higgins et al, is descibed above.

The Office admits that Higgins et al. does not specifically suggest producing the chalcogenide with a polyphosphate surfactant. Lackowicz et al. is cited as disclosing aqueous solutions of CdS with a polyphosphate stabilizer. The polyphosphate stabilizer is equated to a surfactant.

The rejection is based on the position that it would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the disclosures because polyphosphates were known to be stabilizers for CdS in aqueous solutions and because Higgins et al. discloses the method working with the generic surfactant and chalcogenide. Motivation is argued to be found in the application of a known useful technique to known materials.

With regard to claim 7, the Office argues that it would have been obvious to one of ordinary skill in the art at the time of the present invention to use polyphosphate materials as the surfactant stabilizing the chalcogenides in solution because such was suggested by Lackowicz et al. in view of Higgins et al.'s generic teaching of a surfactant and chalcogenide.

With respect to claims 8, 18, 23 the Office opines that it would have been obvious to one of ordinary skill in the art at the time of the present invention to use a polyphosphate such as hexametaphosphate as the surfactant because Lackowicz et al. has suggested such a use and Higgins et al. discloses that the dispersion is formed by a generic surfactant.

With respect to claims 9-11, 24-26 the Office opines that it would have been obvious to one of ordinary skill in the art at the time of the present invention to form such a chalcogenide doped dispersion because the chalcogenide materials were known to Higgins et al. to form aqueous dispersions when combined with surfactants.

Applicants respectfully submit that the inventions of claims 7-11, 18 and 23-26 are clearly distinguished over that disclosed in Higgins et al., since a totally different precipitation step is



disclosed in the process according to amended claim 1 from the precipitation step disclosed in Higgins et al.

Lackowicz et al. discloses:

"A nanoparticle, comprising: a semiconductor, capable of fluorescing, wherein the nanoparticle has an average diameter less than 5  $\mu\text{m}$  and wherein the nanoparticle is size-stabilized."

Lackowicz et al. at page 19, lines 11-13, further discloses a process for the nanofabrication of CdS/polyphosphate nanoparticles:

" $2 \times 10^{-4}\text{M}$   $\text{Cd}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$  in degassed water was mixed with an equivalent amount of sodium polyphosphate,  $\text{Na}_6(\text{PO}_3)_6$ . Solid  $\text{Na}_2\text{S}$  was added, with vigorous stirring, to yield  $2 \times 10^{-4}\text{M}$  sulfide. The solution immediately turned yellow. Under UV light, the solution glowed red-orange."

Diafiltration/ultrafiltration is not disclosed in either Vacassy or Lackowicz.

Applicants contend that there is no motivation for substituting the specific precipitation step of Higgins et al. with that of Vacassy and Lackowicz, other than improper hindsight, since it is improper to regard a thioglycerol or polyphosphate as a surfactant.

In seeking to arrive at a motivation of one skilled in the art to combine the teaching of Higgins et al. with that of Vacassy and Lackowicz the Office improperly equates the functions of a surfactant with that of a stabilizer. "Surfactant" is an

abbreviation of surface-active agent, which is a soluble compound that reduces the surface tension of liquids, or reduces interfacial tension between two liquids or a liquid and a solid [see McGraw-Hill Dictionary of Scientific and Technical Terms Fourth Edition, Editor S. P. Parker, McGraw-Hill Book Company, New York (1989), at page 1862]. A "stabilizer" stabilizes in some shape or form the entity with which it is associated.

Furthermore, the Office improperly asserts that Higgins et al. discloses a method working with the generic surfactant and chalcogenide. This is not the case. First there is no specific teaching of metal chalcogenides and secondly two specific surfactants are disclosed which together form micelles. A micelle is a colloidal aggregate of unique number (between 50 and 100) of amphipathic molecules, which occurs at a well-defined concentration known as the critical micelle concentration, see McGraw-Hill Dictionary of Scientific and Technical Terms Fourth Edition, Editor S. P. Parker, McGraw-Hill Book Company, New York (1989), at page 1193].

Neither Vacassy nor Lackowicz provide motivation for substituting the precipitation step contained therein with the precipitation step of Higgins et al. except for the motivation provided by the instant application. Assuming, *arguendo*, that one

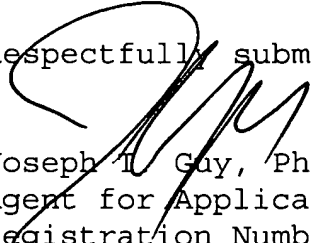
did consider such a substitution they would expect the advantages offered by Higgins et al. to be mitigated thereby defeating the reason for relying on Higgins et al. in the first place. A hindsight combination of art based on reliance of the claims under review is improper. A rejection of this type is even more improper when the offered by the cited art are eliminated to make such a combination. Furthermore, the combination requires that a surfactant and stabilizer be equated as one in the same which is not supported by the teachings relied on or the understanding of one of skill in the art. Even further, to make such a combination, the Office improperly asserts that Higgins et al. discloses a method working with a generic surfactant and chalcogenide which is not supported. There is no teaching of metal chalcogenides and Higgins et al. relies on two specific surfactants which, taken together, form micelles.

Based on the foregoing Applicants respectfully submit that amended claim 1 and claims 7-11, 18 and 23-26 dependent thereon are patentable under 35 U.S.C. §103(a) over Higgins et al. in view of Vacassy and Lackowicz.

## CONCLUSIONS

Claims 1-26 are pending in the present application. All claims are in condition for allowance. Notice thereof is respectfully requested.

Respectfully submitted,

  
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